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Topic of the Research: A Study of Consumer Purchase Intention Towards Electric Vehicles.

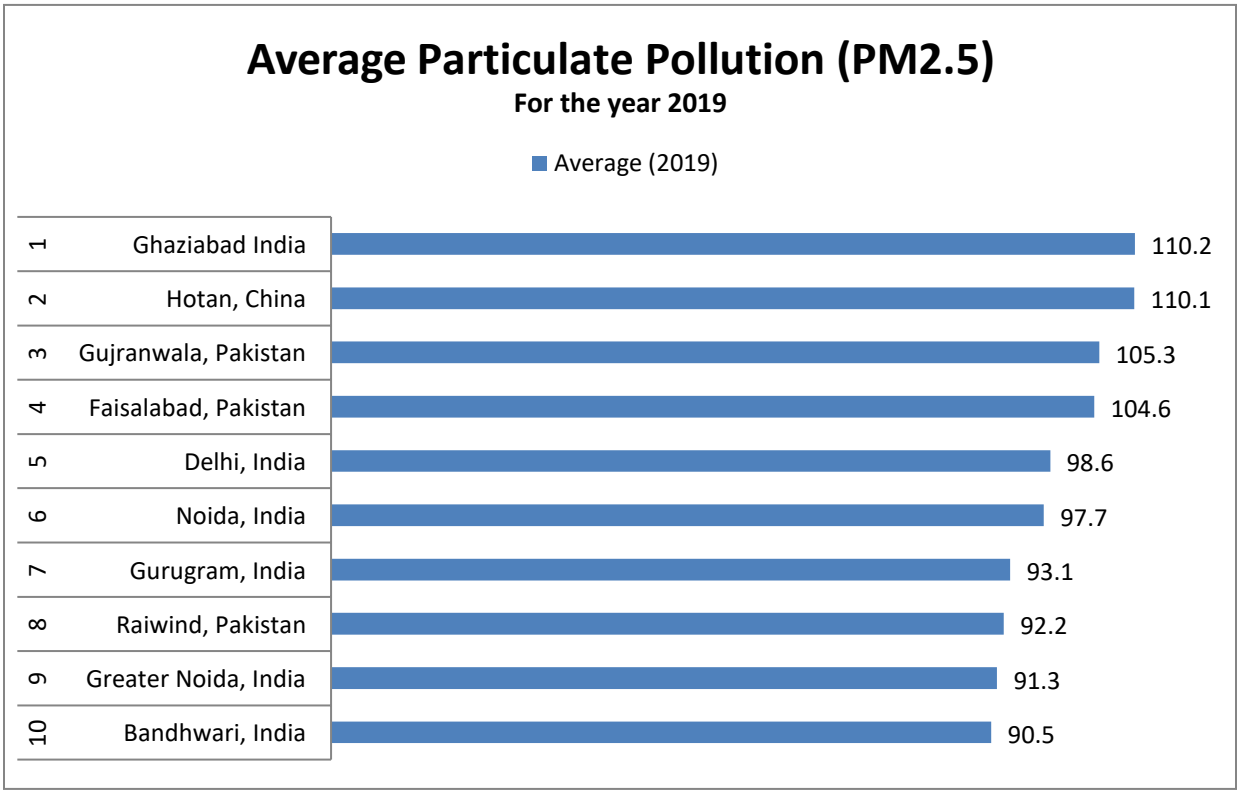
1. Introduction

Heavy reliance on automobiles raises a variety of environmental concerns including tailpipe emissions of green house gases (GHGs).The cost of this type of air pollution is immense on both human health and economy. Moreover huge dependency of vehicles on non renewable energy sources has led to an alarming situation as these sources are continuously depleting and the number of motor vehicles on the roads is constantly increasing. In order to impede the situation and promote a more sustainable economy, one solution is the adoption of most innovative cluster of automotive sector i.e. Electric Vehicles. An electrical vehicle (EV) operates on an electric motor instead of an internal–combustion engine, with zero or ultra low tailpipe emissions, increased fuel efficiency and much lower noise.

Global scenario indicates that governments of many developed countries have already formulated the policies and programs to promote the adoption of electric vehicles successfully with a projected CAGR (compound annual growth rate) of 22.6% by 2027. Indian government has also taken several monetary and non monetary initiatives to promote manufacturing and adoption of electrical vehicles. Besides favourable policies designed, this segment is not making meaningful growth since last many years as EV market penetration in India is only 1% of the total vehicle sales. In light of these facts an attempt has been made to understand the buying intentions of Indian consumers towards electric vehicles.

1.1 Air Pollution in India

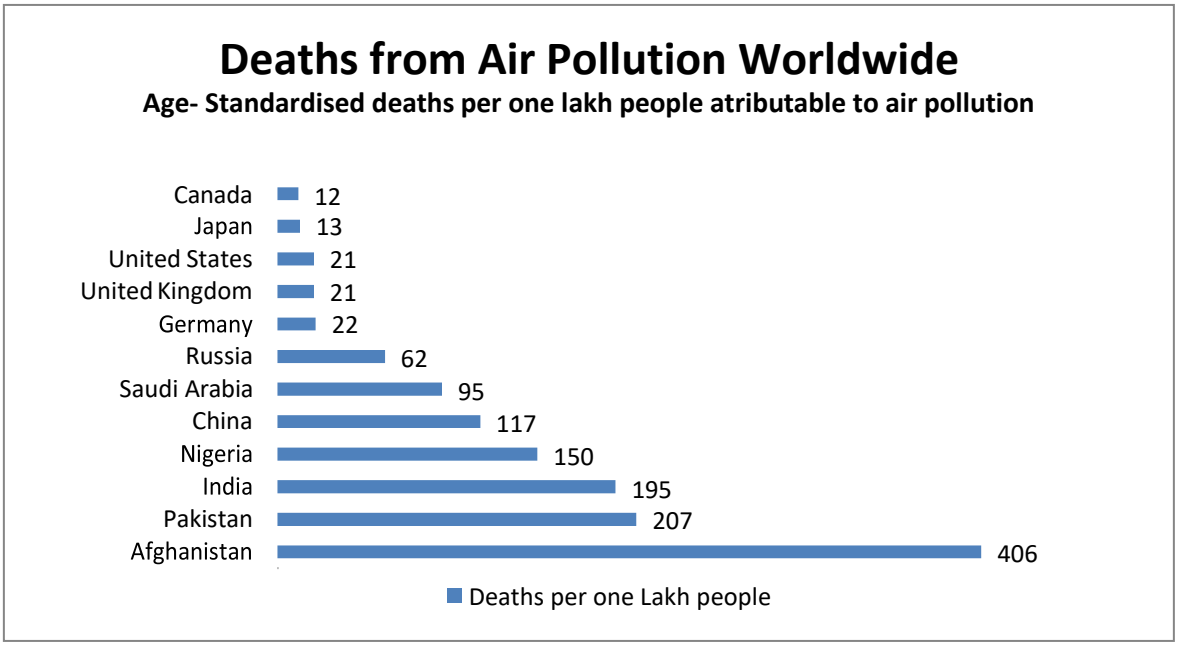
Air pollution due to increasing number of vehicles on the road is one of the main concerns of today's time. 6 of the world's 10 most polluted cities are in India. On average its cities exceed World Health Organization (WHO) guidelines for the amount of particulate pollution (PM2.5) in the atmosphere by 500% (IQAir report).



Source: World Air Quality Report 2019, IQAir

Fig 1: Top ten polluted cities in the world (2019)

As the number of motor vehicles on the roads double every 8-10 years in India, CO2 emissions are bound to get worse. These motorized vehicles emit large volumes of unhealthy emissions such as carbon-di-oxide, hydrocarbons, carbon monoxide, nitrogen oxides, particulate matter, that in turn causes cancers, strokes and heart disease, stunting children's growth and development, and even reducing human intelligence. Globally it causes 7 million premature deaths per year out of which more than one million are in India, and reduces life expectancy by an average of 1.8 years, making it more harmful than smoking, alcohol and drug use, unsafe drinking water and sanitation, road injuries and HIV/AIDS. According to the International Council for Clean Transportation, an estimated 74,000 premature deaths were attributed to air pollution from transportation tailpipe emissions in India in 2015.



Source: Health effects institute: State of Global Air 2018

Fig 2: Deaths from air pollution worldwide

1.2 Dependency of Indian Transport Sector on Non Renewable Energy sources

In the era of globalization and connectivity, environmental degradation is being accelerated by the ever-increasing transportation sector, and will be further exaggerated with the growing middle class segment in developing countries and their increased demand for their own 'first Car'. Currently, the transport sector accounts for 18% of total energy consumption in India. This translates to an estimated 94 million tonnes of oil equivalent (MTOE) energy. If India were to follow the current trends of energy consumption, it would require an estimated 200 MTOE of energy supply annually, by the year 2030 to meet the demand of this sector. At the moment, this demand is being met mostly through imported crude oil, which therefore makes this sector vulnerable to the volatile International crude oil prices. Moreover, the sector also contributes an estimated 142 Million Tonnes of CO2 emissions annually, out of which 123 million tonnes is contributed by the road transport segment alone.

In this regard Hon'ble Supreme court of India banned the sale of vehicles with BS IV norms with effect from 1st April, 2020. Instead (BS VI) norms would come into force. Keeping in view the government's climate change commitments to reduce emission intensity by 33- 35% by 2030 from 2005 levels, it is pertinent to introduce alternative means in the transport sector which can be coupled with India's rapid economic growth, rising urbanization, travel demand and country's energy security. And the solution lies in electric mobility. **Electric mobility** presents a viable

alternative in addressing these challenges, when packaged with innovative pricing solutions, appropriate technology and support infrastructure.

1.3 Electric Vehicles

An electric vehicle (EV) operates on an electric motor, instead of an internal-combustion engine that generates power by burning a mix of fuel and gases. Electric vehicles have low running costs and are environmentally friendly as they use little or no fossil fuels (petrol or diesel).

Therefore, such a vehicle is seen to be a possible replacement for current-generation automobile, in order to address the issue of rising pollution, global warming, depleting natural resources, etc. Though the concept of electric vehicles has been around for a long time, it has drawn a considerable amount of interest in the past decade amid the rising carbon footprint and other environmental impacts of fuel-based vehicles.

Types of electric vehicles

The electric vehicles are differentiated into three basic categories: Battery Electric Vehicles (BEV), Plug-in Hybrid Electric Vehicle (PHEV) and Hybrid Electric Vehicle (HEV).

Battery Electric Vehicle (BEV)
These vehicles are also called fully electric vehicles. These zero emission vehicles contain motors and batteries as their source of ignition. The battery is charged through an external source of power such as DC fast charger or AC chargers. On average, the BEVs take around 8 hours to get fully charged using an AC charger. This time can be reduced to 1 hour using a DC fast charger. These electric vehicles have a range from 250kms to 500kms depending upon the battery capacity and the motor.
Some of the 4-wheeler BEVs in India are Tata Nexon EV, Hyundai Kona Electric, Mahindra eKUV100, MG ZS EV and more. 2-wheeler BEVs in India include Ather 450, TVS iQube, Bajaj Chetak Electric and many other startups are planning to launch by the end of this year.

Hybrid Electric Vehicle (HEV)
These types of electric vehicles are powered by both, fuel as well as electricity. The electricity is generated by the vehicle's own braking system. The heat produced by the brakes is converted into electrical energy. This process of conversion is called Regenerative Braking. The electric motor is used to start off the HEVs. Then the propulsion is taken care of by the IC engine. This ensures better fuel efficiency. The operation of the engine as well as the motor is controlled by the ECU.
Some HEVs in India are Toyota Prius Hybrid, Honda Civic Hybrid and Toyota Camry Hybrid. Maruti Suzuki recently introduced its hybrid system in few models too like Maruti Swift Hybrid and Nexa Ciaz.

Plug-in Hybrid Electric Vehicle (PHEV)

These hybrid electric vehicles can recharge their batteries through regenerative braking or through the external source of power. The HEVs travel about 3-4kms before the engine is switched on, PHEVs can go up to 65kms before the engine provides the required assistance for the propulsion of the vehicle.

PHEV options available in India are Mahindra e-Verito, BMW i8 and the Volvo XC90 T8.

1.4 Benefits of an Electric vehicle

Electric mobility comes with zero or ultra-low tailpipe emissions of local air pollutants with lower noise. Thus this innovative cluster for the automotive sector, can provide a major boost to the economic and industrial competitiveness by attracting investments, especially in developing countries. Benefits of EVs are listed below:

Benefits to the Environment:

i. **No sound pollution:** Electric vehicles produce no-sound, unless someone buys a high-end model or an electric sports car with artificially induced sound resonators.
ii. **No smoke or air pollution:** Electric vehicles are categorized as no pollution vehicles as there are zero or no tailpipe emissions.
iii. **Conservation of natural resources:** Electric vehicles do not use non renewable natural resources like petrol and diesel, as these vehicles operate on electric motors instead of an internal-combustion engine.

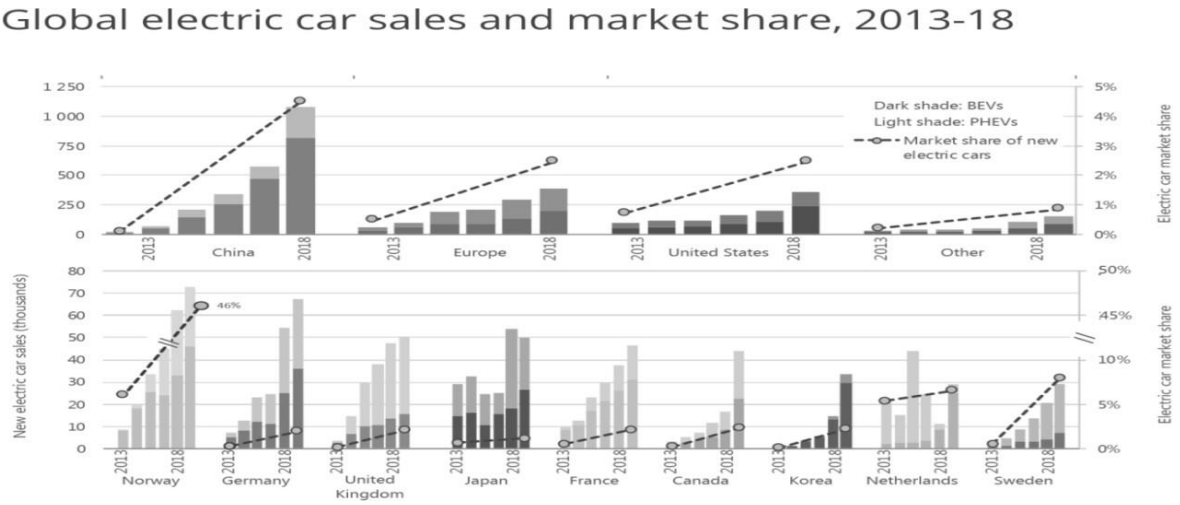
Benefits to the consumers:

i. **Low maintenance**: Electric vehicles have very less moving parts than conventional-fuelled car or bike. This means that there is no engine oil to be flushed, air filters to be replaced or parts to be lubed. A customary battery check-up is sufficient.
ii. **Lower Running cost:** A car or two-wheeler running on electricity is guaranteed to have lower operating costs. It is pertinent that Indian market witnesses constant shoot in the oil prices but the price for electricity has nearly stayed the same. That makes the running cost for an EV less than 60 paisa/km if calculated.
iii. **Lower registration fees or perhaps none at all:** Government is offering almost negligible registration charges on the purchase of electric vehicles. Moreover, municipality-designated parking spots are free for EVs.
iv. **Easy Charging:** Charging an electric vehicle is possible at every place that has a plug.

1.5 Growth of Electric Vehicles

The global electric market was valued at $162.34 billion in 2019, and is projected to reach $802.81 billion by 2027, registering a CAGR (compound annual growth rate) of 22.6%. Asia Pacific was the highest revenue contributor, accounting to $84.84 billion in 2019, and is estimated to reach $357.81 billion by 2027, with a CAGR of 20.1%. North America is estimated to reach $194.20 billion by 2027, at a significant CAGR of 27.5%. Asia Pacific and Europe

collectively accounted for around 74.8% share in 2019, with the former constituting around 52.3% share. North America and Europe are expected to witness considerable CAGRs of 27.5% and 25.3%, respectively, during the forecast period. The cumulative share of these two segments was 40.1%in 2019, and is anticipated to reach 51% by 2027. In absolute terms, China remains the world's largest EV market, with 2.3 million electric vehicles in active use. To put that into perspective, that's nearly half (45%) of the global stock of EVs. Europe and the US are relatively far behind with 1.2 and 1.1 million EVs respectively.



Source: International Energy Agency

Fig 3: Global electric car sales and market share (2013-2018)

The Indian electric car market size was valued at $71.1 million in 2017 and is projected to reach $707.4 million by 2025, witnessing a CAGR (compound annual growth rate) of 34.5% during the forecast period. At present, however, EV market penetration is only 1% of the total vehicle sales in India, and of that, 95% of sales are electric two-wheelers. Government schemes and subsidies are playing a major role in the growth of this market. In addition, the growing environmental concerns owing to high pollution levels in major cities of the country are also positively affecting the market growth.

1.6 Government initiatives towards electric mobility in India

The government has taken multiple initiatives to promote manufacturing and adoption of electric vehicles in India. Government has come up with many guidelines and standards to ensure safe, reliable, accessible and affordable charging infrastructure. Moreover provisions are being made to collect affordable tariff charges from EV owners and to generate employment opportunities for small entrepreneurs for creation of EV charging Infrastructure and eventually create market for EV charging Business.

- In India, the first concrete decision to incentivize electric vehicles was taken in 2010. A subsidy scheme of Rs 95-crore was approved by the Ministry of New and Renewable Energy (MNRE) as a financial incentive for manufacturers for electric vehicles. However, the scheme was later withdrawn by the MNRE in March 2012.
- In 2013, India unveiled the 'National Electric Mobility Mission Plan (NEMMP) 2020' to make a major shift to electric vehicles and to address the issues of national energy security, vehicular pollution and growth of domestic manufacturing capabilities. Though the scheme was to offer subsidies and create supporting infrastructure for e-vehicles, the plan mostly remained on papers.
- In 2016, faster adoption and manufacturing of electric vehicles (FAME) scheme was announced, with an initial outlay of Rs 75 crore. The scheme was announced with an aim to offer incentives for clean-fuel technology cars and to boost their sales up to 7 million vehicles by 2020.
- In 2017, Transport Minister made a statement showing India's intent to move to 100 per cent electric cars by 2030. However, the automobile industry raised concerns over the execution of such a plan. The government subsequently diluted the plan from 100 per cent to 30 per cent.
- In February 2019, the Union Cabinet declared Rs 10,000-crore program under the FAME-II scheme. This scheme came into force from April 1, 2019 and is planned to be completed in 2022. The main objective of the scheme is to encourage a faster adoption of electric and hybrid vehicles by offering upfront incentives on purchase of electric vehicles.
- FAME II scheme also proposes establishment of charging infrastructure, whereby about 2,700 charging stations will be established in metros, other million-plus cities, smart cities and cities of hilly states across the country. This is done to ensure that there is availability of at least one charging station in a grid of 3km x 3km. Establishment of charging stations is also proposed on major highways connecting major city clusters. On such highways, charging stations will be established on both sides of the road at an interval of about 25 km each.
- The scheme will also provide additional income tax deduction of 1.5 lakh on the interest paid on loans taken to purchase electric vehicles (EV).
- GST council has also decided to lower the GST rate on electric vehicles from 12 per cent to 5 per cent.
- With an intention to incentivise e-mobility, customs duty is being exempted on certain parts of electric vehicles as well.
- Now even the Vehicles that don't come pre-fitted with batteries will be allowed to register. For promoting electrical two wheelers and three wheeler vehicles, there are recommendations to delink the cost of battery (which accounts for 30-40% of the total cost) from the vehicle cost. Vehicles could then be sold in the market without the battery. This will make the upfront cost of the electrical 2 wheeler (2W) and 3 wheelers (3W).
- The government has approved green licence plates bearing numbers in white fonts for private e-vehicles and yellow for taxis. The purpose behind distinctive number plates is their easy identification for preferential treatment in parking, free entry in congested zones besides other proposed benefits like concessional toll.

- Besides, the government is contemplating permitting youth in the age group of 16-18 years to drive e-scooters, which are gearless that will lead to a big demand for e-scooters.
- Government is also considering exemption from permits for electric vehicles.

Besides all these benefits of electric vehicles and government's monetary and non monetary incentives, the Electric Vehicle industry in India is far behind, with less than 1% of the total vehicle sales. The government or the car companies expect that in the next two to three years there will be any real buying of electric vehicles. Currently, Indian roads are dominated by conventional vehicles and have approximately 0.4 million electric two-wheelers and a few thousand electric cars only. Barely more than 8,000 EVs were sold locally during the past six years whereas; China sells more than that in two days, according to the data compiled by Bloomberg.

2. Review of Literature

2.1 Purchase intentions

The Business Dictionary gives us the definition of purchase intention in minimal words as "a plan to purchase a particular good or service in the future". It is the degree of willingness and inclination of consumers to buy a product or service within a certain period of time. Traditionally, the term Intention is defined as the factors that stimulate and drive consumer's purchase of products and services (Hawkins & Mothersbaugh, 2010). One of the most common approaches undertaken by marketers in gaining an understanding about consumer's actual behavior is through studying their intentions (Blackwell, Miniard, & Engel, 2006; Ghalandari & Norouzi, 2012). Kim and Pysarchik (2000) have demonstrated the existence of a strong correlation between purchase intention and consumer's purchase behavior. Therefore, consumer's intention toward a particular behavior has remained the central focus of well-known theories like theory of reasoned action (TRA). This claim is also supported by Azjen (1991) who mention that intention is the factor that motivates consumers and in turn influences their behavior. According to Haque et al. (2015), the probability that a particular behavior will actually be performed by individuals largely relies on the strength of their intentions. When the intentions of performing certain behavior are strong, there are higher likelihoods that the respective behavior will be performed.

In this study an effort has been made to understand the determinants of consumer purchase intention towards an electric vehicle using Theory of Planned behavior, consumer attributes and product attributes.

2.2 Purchase Intentions and Theory of Planned behavior (TPB)

TPB is considered as one of the most useful frameworks in explaining human intentions leading to behavior in a wide range of fields and more specifically it has great applicability in the field of environmental psychology (Stern, 2005). The theory of planned behavior was proposed by Icek Ajzen in the year 1985 to explain the process of individual behavior during decision making. TPB model states that human behavior is guided by three kinds of consideration: behavioral beliefs, normative beliefs, and control beliefs which further result into certain outcomes such as attitude towards the behavior, subjective norm, and perceived behavioral control respectively. In combination, attitude, subjective norm, and perceived behavioral control all together lead to the formation of behavioral intention.

2.2.1 Attitude

Attitude as per Allport (1935) has been defined as: "A mental and neural state of readiness, which exerts a directing, influence upon the individual's response to all objects and situations with which it is related". While attitudes of environmentally concerned consumers as per Zelezny and Schultz (2000),"are rooted in a person's concept of self and the degree to which an individual perceives him or herself to be an integral part of the natural environment". Attitude represents what consumers like and dislike (Blackwell et al. 2006) and the product purchasing decisions of the consumers are often based on their attitudes concerned with environment (Irland 1993; Schwepker Jr and Cornwell 1991).Customers who were environmentally conscious along with high ecological concern consider the environmental impact of their buying behavior and they strongly feel that they can contribute for the preservation of the environment (Webster Jr 1975; Wiener and Sukhdial 1990). The attitude of consumers impact the behaviour of the customers towards their willingness to spend more for environmentally friendly products. A study conducted in Australia stated that consumers with favourable attitudes towards environmentally friendly products are more likely to purchase more environmentally friendly products (Cheah and Phau, 2011).Research on consumer attitudes towards green products have been scanty but are gaining speed. In one of the studies on consumer attitude towards green products, researchers have stated that consumer's attitude on the government's role and their personal norm towards the environment contributed significantly towards their attitude for green products (Chan 1999; Chen and Chai 2010; Polonsky et al.1998). Another study in Canada checked the interplay between environmental groups and business firms, and the complexities of environmental issues while looking into consumer attitudes and behaviors and suggested that firms should be cautious about directly positioning either the firm or its products as environmentally friendly (McDougall 1993). Level of knowledge of consumer is significantly related to consumer's positive attitude and belief about the positive effects of using green packaging (P. Mishra et al., 2017). Therefore we can consider attitude as an important factor to study.

2.2.2 Subjective norm

Subjective norm can be understood as the perceived social force to carry out a particular behaviour (Ajzen, 1991). Under social pressure an individual not only performs behaviour but he

is also provided with the information about the appropriateness of behaviour under consideration (Jager, 2000). Purchase intentions are independently affected by subjective norms (Robinson & Smith, 2002). Subjective norm has been extensively analyzed in the studies on environmentally responsible behaviour (Biel & Thøgersen, 2007). Various studies such as the study on sustainable food by Vermeir and Verbeke (2006), study on organic food by Chen (2007) and Gotschi et al. (2007) indicate a relationship that is both significant and positive , between subjective norm and a consumer's intention .Some other studies undertaken by scholars such as Sidique et al. (2010) and Shaw (2008) conclude that there is a direct and positive relationship between exhibition of behaviour resulting in betterment of environment and the social pressure or social norm . Contrary to it Studies by Lopez-Mosquera et al. (2014) and Tan et al. (2017) have also failed to confirm the significant positive impact of subjective norms on consumers' purchase intention. It was also evident from some past studies by Cialdini and Trost (1998); Trafimow and Finlay (1996) that there is a relatively weaker impact of subjective norms on purchase intention or actual behavior.

2.2.3 Perceived behavioral control

Perceived behavioral control refers to the degree to which a person believes that they control any given behavior. According to Ajzen (1991), it is simply the perceived ease or difficulty of performing a particular behavior. Perceived behavioral control has its roots in Atkinson's (1964) theory of achievement motivation which emphasizes on the expectancy of success i.e. on perceived probability of succeeding in a given scenario. Ajzen (1991) also mentioned that the perceived behavioral control and the behavioral intention in conjunction may help in directly ascertaining a particular behavior. Several researchers have concluded that an individual's confidence in his or her ability to control and thereby display the behavior has positive relationship with the purchase intention or the purchase behavior (e.g., Baker et al., 2006; Taylor & Todd, 1995). In other contexts (Yadav and Pathak, 2016; Tan et al., 2017), suggested that perceived behavior control is a strong predictor of pro environmental consumer behavioral intention.

2.3 Consumer attributes

These refer to the variables that lay an impact on the consumer intentions while making a purchase decision. Here is a tentative list of consumer variables that are wished to be incorporated in the study.

2.3.1 Concern for the environment

Concern for the Environment refers to awareness among people about the environmental problems, the support and efforts to solve such problems and their willingness to contribute personally for a solution (Dunlap, 2002; Bickart and Ruth, 2012). Pickett-Baker and Ozaki

(2008) highlighted that consumer's concern for environment influences their buying behavior and they take every step possible in protecting the environment. Awareness of eco-brands and intention to buy them was influenced by the belief in eco-friendly products and their desire to save the environment (Wang et al., 2013; Koenig-Lewis et al., 2014). Environmental concern was reflected in a person's involvement in activities related to environment protection (Kilbourne and Pickett, 2008). Consumers were more likely to buy eco-friendly packaged products and it showed their commitment towards the environment (Magnier and Schoormans, 2015; Pires et al., 2015). Environmentally friendly behavior of the consumers was the key factor in understanding their concern for the environment (Bamberg, 2003).The study conducted in Portugal highlighted the importance of environmental awareness as an important factor for altering the attitude of consumers (G.Martinho et al., 2015).

2.3.2 Knowledge of the consumer

Knowledge in consumer research is regarded as a relevant factor that not only significantly affects how consumers gather and organize information but also how this information is used to evaluate products and services and influences the decision making process of the consumers (Murray and Schlacter 1990;Alba and Hutchinson 1987;Brucks 1985). Vining and Ebreo (1990) as well as Chan (1999) have shown that knowledge of the consumer about environmental issues is a vital indicator of ecologically friendly behavior. (Polonsky et al., 1998) found that individuals who were highly knowledgeable were willing to pay higher prices for green products. Both general knowledge of consumers and environmental behavior were affected by education, age and gender, with carbon knowledge being affected by education, while no demographic factors influenced carbon related behavior. (Polonsky et al., 2011). Consumers who were more concerned about the environment were more knowledgeable about green packaging than consumers who were less concerned about the environment (P.Mishra et al., 2017).

2.3.3 Demographics

Gender is a factor that affects eco-friendly purchasing behavior, with women being more ecologically conscious and engaging more in the purchase of environmentally friendly goods compared to men(Banerjee and McKeage, 1994); McIntyre et al., 1993). La roche et al. (2001) also showed that women are more likely to buy green products. Although the results for gender show reasonable similarity in results of studies by different authors, but other demographic aspects can also affect green purchasing behavior. There is no difference between women and men concerning the purchase of green products and environmental attitudes, but their study was focused on young people (Chen and Chai, 2010). Various authors have studied the effect of age on green consumption behaviors. Vining and Ebreo (1990) discovered that older people are more devoted to making environmental friendly purchases. Younger and older age groups have different tendencies towards engaging in environmentally friendly purchases (Roberts, 1996). Concerning packaging recycling, older people have been reported as being more likely to perform recycling compared with younger individuals (Kelly et al., 2006; Martin et al.,2006; Saphores and Nixon, 2014). However, CorralVerdugo (2003) found no influence of age on recycling behavior. Concerning gender several studies have established that women are more devoted to recycling than are men (Johnson et al., 2004; Schultz et al., 1995; Stern et al., 1995), but other authors have detected no relationship (Corral-Verdugo, 2003; Do Valle et al., 2004;

Dominaand Koch, 2002; Gamba and Oskamp, 1994; Saphores and Nixon, 2014; Werner and Makela, 1998).

2.3.4 Willingness to Pay Premium

The willingness to pay concept originated in the pricing and consumer behavior domain of marketing (Breidert et al., 2006). It accurately predicts the purchasing behavior of the buyer's and ultimately assists organizations in developing their pricing strategies (De Pelsmacker et al., 2005). Breidert et al. (2006) came out with different techniques that could be used to determine buyers' willingness to pay.

Self esteem, perception, and recognition had a significant influence on consumer's willingness to pay for a premium (Boateng et al., 2015).From a research in China, several factors of consumer's willingness to pay for low carbon products have been determined (Liu et al., 2017). These outcomes have provided various thoughts and evidence for this study regarding the identification of factors affecting consumer's willingness to pay.

Yadav and Pathak (2017)Willingness to pay price premium was not reported to have any significant impact on consumer's intention to purchase a product with sustainable packaging, which contradicted the findings of Choi and Parsa (2007), Kang et al. (2012), Shen (2008). This may be because price is still an issue for Indian consumers as they are price sensitive in nature (Manaktola and Jauhari, 2007).A study conducted in India does not conclude that consumers with a higher level of concern for the environment were considerably more likely to be willing to pay a premium for green packaging than consumers who indicated less concern for the environment (P.Mishra et al., 2017). But contrary to this consumers in India prefer to buy goods from companies behaving in an environmentally responsible manner such as using eco friendly packaging, and they are ready to accept higher prices for the products (Praksh and Pathak, 2017). Most of the consumers were willing to pay more for a product contained in sustainable packaging but packaging design is not an important feature for the consumer rather high product quality and high functionality of the product were the two important aspects.70% of the consumers were willing to pay a premium of between5% to 1% for ecological packaging (G. Martinho et al. (2015). After doing factor analysis on ten factors affecting willingness to pay, four principal factors were obtained and after being ranked by weight , environmental concern occupies the largest weight followed by packaging quality, commodity and price of the green package (Y. Hao et al., 2019).

2.3.5 Financial Benefits

Previous important studies have concluded that consumers are concerned with financial benefits and are willing to adopt greener vehicles which could reduce the operational cost and improve fuel efficiency (Mourato et al., 2004). It was found that adoption of an EV would depend on whether there are direct financial benefits and conveniences (Said et al., 2003). Upfront purchase price is also an important factor in determining vehicle acceptance (Lane and Potter, 2007). Generally, the majority of consumers will only select cleaner fuels if the price is competitive with existing fuels and the environmental considerations will always be surpassed by price and availability (Bomb et al., 2007). The benefit of a lower fuel cost can be an advantage to prospective alternative fuels vehicle buyers (Heffner et al., 2007; Ozaki and Sevastyanova,

2011). The decision to adopt a cleaner vehicle was influenced by maintenance costs and some other complementary expenditures (Adamson, 2005; De Haan et al., 2006; Potoglou and Kanaroglou, 2007). Recent evidences show that financial benefits are an important motive of consumers to purchase cleaner vehicles (Zhang et al., 2013). Previous research has shown that price, quality, convenience and value are still the most important buying criteria (Roberts, 1996). Attitudes are most likely to be converted into actions if it involves little cost in terms of time, money or comfort (Stern, 1992). In study conducted among Malaysians, it was found that consumers will purchase hybrid vehicles primarily for the tax incentives and savings on fuel costs (The Star Online, 2013). Based on a study conducted by Frost and Sullivan, it was determined that most Malaysians had a strong preference for greener vehicles, provided that there were economically viable (The Star Online, 2014).Therefore, the researchers believe financial benefits play an important role in influencing buying intentions.

2.3.6 Government incentives for buyers

Incentives that target vehicle ownership have been proven to be effective in controlling overall vehicle ownership (Jansen and Denis, 1999). A differentiated subsidy scheme was suggested as part of the public policy in the United States (US) in order to increase the penetration of EVs (Skerlos and Winebrake, 2010). Similarly, in Canada, a reduction in monetary costs, 'taxfree purchase' incentives and low emission rates will encourage households to adopt environmentally cleaner vehicles (Potoglou and Kanaroglou, 2007). To encourage the purchase of low emission vehicles, Subsidies play a role of an important economic instrument (Santos et al., 2010). Based on a study conducted in Ireland by Rogan et al. (2011), it was suggested that ownership tax differentials and incentives can positively influence the purchasing decisions of alternative fuelled vehicles. Tax rebates were found to be positively affected by the large increase in the market share of hybrid vehicles in Canada (Chandra et al., 2010) and Switzerland (De Haan et al., 2007). Previous studies also found that the impact of a vehicle excise duty on carbon emissions reduction has caused a rapid uptake of more efficient vehicles (Borup, 2007). Recent evidence in the US also suggests that fee bate programmes are effective for accelerating the adoption of hybrid vehicle technology (Gallagher and Muehlegger, 2011). Purchasing behavior, overall ownership and the use of vehicles will be directly affected by the pricing and taxation of these vehicles (Brand et al., 2013). In a study conducted among Malaysian consumers, it was found that government's role plays an important predictor of green purchasing behavior (Sinnappan and Rahman, 2011). It is believed that government intervention, such as subsidizing the purchase price, will increase EVs purchase intentions among consumers.

2.4 Product Attributes

Product variables also lay an impact on the consumer intentions while making a purchase decision. These include product features, ease and comfort of using the product, safety involved etc.

2.4.1 Performance measures

Previous studies have found that vehicle performance and economic concerns have a direct influence on the purchase decision-making process (Adamson, 2005; Kang and Park, 2011). In a study on hybrid vehicles, it was found that performance attributes, such as comfort, quietness, ease of driving and automatic transmission, were among the most important factors influencing consumer adoption (Ozaki and Sevastyanova, 2011). In other studies, it was found that the substantial shortcoming potential for consumer decisions is the limited travelling range of an EV (Beggs and Cardell, 1980; Bunch et al., 1992; Calfee, 1985; Greene, 1985; Hensher, 1982). Therefore, it was concluded that the major limitations in reluctance to purchase an electric car is short driving range and long recharging time (Cheron and Zins, 1997). A study on German car buyers found that the majority of the respondents preferred more horsepower when making a purchase decision (Achtnicht, 2012). In a study among Chinese consumers, performance attributes, such as riding comfort, safety, range, convenience of use, and operability, were found to have impact on the acceptance of a new energy vehicle (Zhang et al., 2013). Hence these previous studies prove that performance attributes have a direct impact on consumer buying intentions.

2.4.2 Infrastructure readiness

Sperling and Kitamura (1986) found that the factor responsible for preventing the introduction of new transportation fuel is the absence of retail infrastructure selling that fuel. This is one of the most important factors during decision-making processes of whether or not to buy a vehicle running on a new fuel type. According to the findings by Dagsvik et al. (2002) alternative fuel vehicles will only appear to be competitive with conventional vehicles, if the refuelling infrastructure is in place. EVs are usually perceived as having an inadequate mobility range. Hence, the drivers may experience ‘range anxiety’, where they feel ‘stranded’ if charging facilities are not offered (Browne et al., 2012). A lack of charging facilities may also lead to the perception that EVs are unsuitable for long distance trips (Melaina and Bremson, 2008). This has decreased the adoption of EVs, despite their low environmental impact and high energy efficiency (Anegawa, 2010; Martin et al., 2009). Thus, the establishment of vehicle charging infrastructures is very crucial to permit the smooth deployment of electric mobility (Silvester et al., 2013). EVs disadvantages, as compared to conventional vehicles, include limited driving ranges and longer recharging times (Garling and Thogersen, 2001; Ustao_glu and Yıldız, 2012). Schroeder and Traber (2012) suggested that a fast-charging infrastructure will benefit and facilitate long-range drivers of EVs; this may be crucial in helping push EVs towards market

penetration. This is very much supported by Liu (2012), who suggested that the spatial distributions are both largely determined by charging demands/local refueling, even though the fact that there are many differences between EVs charging infrastructure and petrol refueling stations. Therefore, if the user chooses to use an EV for their travelling for medium and long distances, charging station is certainly a compulsory. Hence it is believed that infrastructure readiness plays an important role in order to increase market penetration. Therefore, it will directly influence the buying intentions of the public.

All these are the tentative variables to be included in the study of consumer purchase intentions towards Electric vehicles. Addition or subtraction in the number of these variables may happen with further review required for this research.

3. Research Gaps

i. The extensive literature survey justifies the numerous evidences of research studies on electric vehicle. Only a few research studies have been conducted in the Indian context and the scope of these studies has been confined to metropolitan cities only.
The statistics of world Air Quality Report 2019 show the alarming rate of air pollution in India and Indian cities are making their presence in first 10 most polluted cities of the world. Hence it becomes essential to conduct this study in the Indian context.

ii. Electric vehicle is relatively a newer concept in India. Indian Government has taken multiple initiatives to promote manufacturing and adoption of electric vehicles in India. Despite these efforts, the share of electric vehicle industry is less than 1% of the total vehicle sales. In the light of this statement, a study needs to be carried out which explains the relation of product attributes and consumer attributes with purchase intention towards electric vehicles. This will help the marketers and government to understand the consumer mindset so that they can formulate or alter their product and marketing strategy effectively.

iii. Baker and Ozaki (2008) highlighted that consumer's environmental concern influences pro-environmental buying behavior. Price of a product also plays a dominant role in influencing the buyer's intention to purchase a particular product. There is a need to see whether the Indian consumers, who are actually value conscious, will give more importance to the environmental concern or price while buying an Electric Vehicle.

4. Rationale of the Study

Keeping in view the threats posed by increasing air pollution and depleting natural recourses due to increased number of vehicles on the roads in India, there is a need to shift to an alternative means of transport that does not harm the environment and lives of human beings. A quick solution to this is adoption of electric vehicles.

Although there are a lot of studies conducted in the past regarding the adoption of electric vehicles in different countries but not many studies have been conducted from the point of view of Indian consumer's intentions towards purchase of Electric Vehicles. Only one major study could be located focusing on Intentions to purchase hybrid cars limited to only metropolitan cities in India (Khandelwal et al., 2016). This explains the reason for an extensive research over a wider area.

The proposed study will help the marketer and government to understand the market potential of the electric vehicles in India. Moreover the study will provide an insight into the challenges faced by electric vehicle in Indian market like why the pace of acceptance and adoption of electric vehicles is slow among consumers. This indeed will help the marketers to come up with appropriate marketing strategies to ensure the growth in sales in future to address the menace caused by air pollution in India.

5. Objectives of the study

i. To study the determinants of consumer's Purchase intentions towards electric vehicles using Theory of Planned Behavior.
ii. To study the impact of consumer attributes on purchase intentions towards electric vehicles.
iii. To study the impact of Product attributes on purchase intentions towards electric vehicles.
iv. To study the market potential of electric vehicles in Indian.
v. To study the challenges faced by electric vehicles in Indian market.

6. Research Hypothesis

H1: Attitude has a significant positive impact on consumer purchase intention towards electric vehicles.

H2: Subjective Norm has a significant positive impact on consumer purchase intention towards electric vehicles.

H3: Perceived behavioural control has a significant positive impact on consumer purchase intention towards electric vehicles.

H4: Concern for the environment has a significant positive impact on consumer purchase intention towards electric vehicles.

H5: Knowledge of the consumer has a significant positive impact on consumer purchase intention towards electric vehicles.

H6: Willingness to pay premium has a significant positive impact on consumer purchase intention towards electric vehicles.

H7: Government incentives have a significant positive impact on consumer purchase intention towards electric vehicles.

H8: Financial benefits have a significant positive impact on consumer purchase intention towards electric vehicles.

H9: Performance measures have a significant positive impact on consumer purchase intention towards electric vehicles.

H10: Infrastructure readiness has a significant positive impact on consumer purchase intention towards electric vehicles.

7. Research Methodology

Research Design

The present study is descriptive cum exploratory in nature. Theory of Planned Behavior along with product attributes and consumer attributes will be employed to study the purchase intentions of consumers towards an Electric Vehicle. The Primary data on the purchase intentions will be collected through a structured questionnaire that will be formulated after studying the previous researches. For this purpose various statements/ dimensions will be identified which will be measured on a 5 point Likert scale. After designing the questionnaire a pre testing will be conducted through sample survey and focus group interviews. After ensuring

the completeness or modifications (if any) the questionnaire will be finalized. The designed questionnaire will be administered personally or through online sources to the selected sample.

Sample Size and Sampling

Keeping into consideration the population size of target respondents from Haryana, Punjab and Delhi circle, the adequate sample size is calculated using Krejcie and Morgan's formula.

N = the population size

X^2= table value of chi- square

P= population proportion

d = degree of accuracy

From this formula 385 comes out to be an adequate sample size at 95% confidence level and margin of error kept at 5%. Any increased number in population more than this does not lead to major change in sample size. So according to own judgment the total sample size is decided to be 500 in this study.

In total 500 customers will participate in the study from the age group of 16 years and above. Here the lower limit of age has been set 16 years since Government is contemplating permitting the youth in the age group of 16-18years to drive e-scooters, which are gearless.

The multi stage sampling procedure is used in the present study. Firstly, the states are selected on the basis of highest number of registered vehicles (Statista, 2020). On the basis of convenience sampling three states Haryana, Punjab and Delhi are further selected for this study. At the second stage, Cities from Haryana and Punjab will be selected on the basis of pollution level in the cities as per the IQAir report. The target sample will be selected on the basis of convenience and snowball sampling technique. The primary data from the target sample will be collected with the help of face to face interviews, e-mails, telephonic interviewing methodology.

Proposed Statistical Techniques

Appropriate multi variate techniques like Multiple Regression Analysis, chi-square, ANOVA, t-test will be primarily employed along with few other techniques including factor analysis and Structural Equation Modeling (SEM) etc. will be used to analyze the data.

8. Tentative Chapter Scheme

Chapter1: Introduction

Chapter 2: Review of literature

Chapter 3: Research Methodology

Chapter 4: Analysis and Interpretation

Chapter 5: Discussion, Implications and Research Directions

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Signature of Supervisor Signature of Scholar

Signature of Director

(With official seal)